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10/559,915	12/07/2005	Jacobus Josephus Maria Ruigrok	NL030681US1	9555

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EXAMINER	
LOUIE, MANDY C	
ART UNIT	**PAPER NUMBER**
1792	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/559,915	RUIGROK ET AL.	
	Examiner	Art Unit	
	MANDY C. LOUIE	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 February 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Regarding claims 1, 9 and 13, it is unclear how the “no substantial heat transfer from the magnetic layer structure to an environment of the magnetic layer structure takes place” wherein the heated magnetic layer structure itself may be an environment of the magnetic layer structure.

b. Regarding claim 2, it is unclear “the heat is transferred” is referring to since claim 1 recites “that no substantial heat transfer…takes place.”

c. Claim 8 recites the limitation "the at least one bias" in line 3. There is insufficient antecedent basis for this limitation in the claim.

d. Regarding claim 8 it is unclear from “below Neel or Curie temperature” is being referred to what material.

The other dependent claims do not cure the defects of the claims from which they depend; therefore, the dependent claims are also rejected under 35 U.S.C. 112, second paragraph.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

   1. Determining the scope and contents of the prior art.
   2. Ascertaining the differences between the prior art and the claims at issue.
   3. Resolving the level of ordinary skill in the pertinent art.
   4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Voegeli [US 5561896] and evidenced by Pelecky and Fox.

Regarding claim 1, Voegeli teaches a method of fabricating a magnetoresistive transducer having a sensor which includes a magnetic layer by fabricating the transducer on a wafer [abstract] and heating the magnetic layer with an electric current, the electric current comprising a current pulse having a duration that is short enough to spatially confine heating to confine heating to the biasing segment (such that no substantial heat transfer from the magnetic layer structure to an environment of the magnetic layer structure takes place) [col 3, ln 50-60], which would allow for a temperature of the environment before and after the current pulse is substantially the same (since the heat is confined).

Alternatively, a position could be made that a large distance away from the heated magnetic layer that receives no substantial heat (i.e. outside a process compartment) would also read as an environment of the magnetic layer structure takes place that would allow for the temperature to be same before and after the current pulse. It is noted that specifying what would be considered the environment would overcome this broad interpretation.

As for selecting a physical process from a plurality of physical processes having corresponding activation energies in the magnetic layer structure based on the current pulse, Voegeli teaches heating the biasing region until a certain time period above a critical conversion temperature [col 5, ln 30-35], and it is further evidenced by Pelecky that changes in magnetization of a material occur through activation over an energy barrier, wherein each physical mechanism responsible for an energy barrier has an associated length scale [pg 1771]; henceforth, it would have been obvious that one of

ordinary skill in the art would knowingly select a duration and amplitude current exposure to over come the activation energy required to achieve the selected magnetic property that is to be modified from a range of magnetic properties with associated activation energies.

Voegeli further teaches conventional pulse generators can readily supply the required pulse currents with sufficient amplitude and shortness of duration [col 7, ln 15-20] wherein such variables would affect the precision of achieving proper interdiffusion and decrease lateral spreading of heat [col 7, ln 1-7].

Although Voegeli teaches selecting the current duration and amplitude based upon the desired property to be modified (i.e. diffusion), it would have been obvious to one of ordinary skill in the art to either select the physical process for modifying the layer property based upon the current or select the current based upon the physical process for modifying the layer property since the prior art teaches both criteria is inter-related for achieving similar results.

In addition, Fox is provided to show that isolated pulsed current in a magnetic layer structure can facilitate modifying other magnetic properties (i.e. magnetic spins and moments); which would indicate that it is known in the art that electric pulses can be used to help modifying various magnetic properties.

Alternatively, Voegeli suggests different materials may require different heating for changing their characteristics [col 6, ln 47-51]; wherein it would have been obvious to select a physical process based upon the current required for the different materials in order to induce characteristic changes.

Regarding claim 2, although the prior art does not explicitly teach the heat transfer is by heat conduction, it would have been obvious to one of ordinary skill in the art that since the heat generated by the current is provided through solid layers, such heat transfer would be transferred by heat conduction.

Regarding claim 3, the prior art teaches selecting a physical process (interdiffusion) with a magnetic layer [Voegeli, abstract].

Regarding claim 4, the prior art teaches the time period is short enough such to reduce the lateral spreading of heat [Voegeli, col 7, ln 4-6]. Although the prior art does not explicitly teach increasing the amplitude and decreasing the pulse duration of the current pulse; the prior art does in fact teaches the material conversion depends upon the pulse length, amplitude and duty-cycle [Voegeli, col 9, ln 40-45]. It would have been obvious to one of ordinary skill in the art to optimize such variables as workable parameters that would affect the modification of the magnetic process.

Regarding claim 5, the prior art teaches the electric current may comprise a sequence of current pulses [col 7, ln 20-21].

Regarding claim 6, the prior art teaches the device comprises a magnetoresistive device [Voegeli, abstract].

Regarding claim 7, the prior art teaches the device is a sensing device [Voegeli, abstract].

5. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Voegeli evidenced by Pelecky and Fox and further in view of Fox and Mattheis [US 20010020847].

Teaching of Voegeli evidenced by Pelecky and Fox is aforementioned, but appears to be silent in applying a magnetic filed to at least one bias layer during the current pulse and switching off the magnetic filed after a temperature of the bias layer decreases below Neel or Curie temperature. Fox and Mattheis remedy this.

Regarding claim 8, Fox teaches resetting magnetization of a spin valve magnetoresistive element by supplying localized heat to a magnetic layer (pinning layer) with a magnetic field to reiorient the magnetic spins [abstract]. It would have been obvious to one of ordinary skill in the art to provide a magnetic field when supplying a pulsed current to magnetic layer for a magnetoresistive element such as Voegeli, since Voegeli teaches to magnetize the magnetic regions by applying a magnetic filed of saturate the biasing region [col 9, l n60-65]. One would have been motivated to do so in order to reset the magnetic spins so as to increase the performance of the read head [Fox, col 3, ln 10-18].

However, Fox appears to be silent in teaching switching off the magnetic field after a temperature of the bias layer decrease below Neel or Curie temperature. Mattheis remedies this.

Regarding claim 8, Mattheis teaches a method for setting magnetization of a bias layer for a sensor element [title] by applying heat (i.e. by current, 0032) with a magnetic field [abstract] wherein in order to set the sensor after orientation the sensor is cooled to a temperature below a Curie temperature of layer in the sensor [0114]. Although Mattheis does not explicitly teach turning off the magnetic field after reaching a Cure temperature; it would have been obvious to one of ordinary skill in the art that one would

either turn off the magnetic field at or after reaching the Curie temperature and not before so as to ensure the biasing layer is sufficiently orientated and set with the desired orientation.

6. Claims 1-3, and 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fox evidenced by Pelecky and Voegeli.

Regarding claim 1, Fox teaches a method for forming a device with a magnetic layer structure by forming the magnetic layer structure [col 2, ln 62-67], and heating the magnetic layer structure with an electric current, the electric current comprising a current pulse having a duration such that no substantial heat transfer from the magnetic layer structure to an environment (insulating layers) of the magnetic layer structure takes place [col 3, ln 65-67; col 4, ln 1-10], which would allow for the temperature of the environment before and after the current pulse to be substantially the same since no heat was applied to the environment.

Alternatively, a position could be made that a large distance away from the heated magnetic layer that receives no substantial heat (i.e. outside a process chamber) would also read as an environment of the magnetic layer structure takes place that would allow for the temperature to be same before and after the current pulse. It is noted that specifying what would be considered the environment would overcome this broad interpretation.

Fox further teaches selecting a particular duration and amplitude of the current pulse so as to reach a desirable heat temperature so as to orient the magnetic spins

and modify the magnetic moment (physical process) of the magnetic layer structure [col 11, ln 20-40].

As for selecting a physical process from a plurality of physical processes having corresponding activation energies in the magnetic layer structure based on the current pulse, it is evidenced by Pelecky that changes in magnetization of a material occur through activation over an energy barrier, wherein each physical mechanism responsible for an energy barrier has an associated length scale [pg 1771]; henceforth, it would have been obvious that one of ordinary skill in the art would knowingly select a duration and amplitude current exposure to over come the activation energy required to achieve the selected magnetic property that is to be modified from a range of magnetic properties with associated activation energies. Furthermore, Fox teaches resistance is another layer characteristic that may be depended upon the changes caused by modifying magnetic moments of the layer structure [col 7, ln 59-65]; indicating that such physical processes may occur from the pulsed current (wherein the applicant discloses various physical processes to include a change in resistance and a change in magnetization direction, pg 3, ln 15-20).

In addition, although Fox teaches selecting the current duration and amplitude based upon the desired property to be modified, it would have been obvious to one of ordinary skill in the art to either select the physical process for modifying the layer property based upon the current or select the current based upon the physical process for modifying the layer property since the prior art teaches both criteria is inter-related for achieving similar results.

Alternatively, Voegeli is provided as evidenced that it is known in the art that electric pulses can be used for modifying various magnetic properties (i.e. interdiffusion).

Regarding claim 2, although the prior art does not explicitly teach the heat transfer is by heat conduction, it would have been obvious to one of ordinary skill in the art that since the heat generated by the current is provided through solid layers, such heat transfer would be transferred by heat conduction.

Regarding claim 3, Fox evidenced by Pelecky teaches selecting a physical process (orienting magnetic spin) in a magnetic layer (pinning layer) [Fox, col 11, ln 35-45; col 10, ln 35].

Regarding claim 6, Fox evidenced by Pelecky teaches the device comprises a magnetoresistive device [Fox, abstract].

Regarding claim 7, Fox evidenced by Pelecky teaches the device is a sensing device [col 4, ln 3].

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fox evidenced by Pelecky and Voegeli and Mattheis.

Teaching of Fox evidenced by Pelecky and Voegeli is aforementioned, but appears to be silent in applying a magnetic filed to at least one bias layer during the current pulse and switching off the magnetic filed after a temperature of the bias layer decreases below Neel or Curie temperature. Mattheis remedies this.

Regarding claim 8, Fox teaches resetting magnetization of a spin valve magnetoresistive element by supplying localized heat to a magnetic layer (pinning layer) with a magnetic field to reiorient the magnetic spins [abstract].

However, Fox appears to be silent in teaching switching off the magnetic field after a temperature of the bias layer decrease below Neel or Curie temperature. Mattheis remedies this.

Regarding claim 8, Mattheis teaches a method for setting magnetization of a bias layer for a sensor element [title] by applying heat (i.e. by current, 0032) with a magnetic field [abstract] wherein in order to set the sensor after orientation the sensor is cooled to a temperature below a Curie temperature of layer in the sensor [0114]. Although Mattheis does not explicitly teach turning off the magnetic field after reaching a Cure temperature; it would have been obvious to one of ordinary skill in the art that one would either turn off the magnetic field at or after reaching the Curie temperature and not before so as to ensure the biasing layer is sufficiently orientated and set with the desired orientation.

8. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gill [US 6292335] in view of Fox.

Regarding claim 9, Gill teaches a method for fabricating a sensor (i.e. spin valve sensor, abstract) with a first bias layer having a first antiferromagnetic material with a first blocking temperature (i.e. first or second biasing layer) and a second bias layer having a second antiferromagnetic material with a second blocking temperature (i.e. third biasing layer) different from the first blocking temperature [col 3, ln 25-35], and a

magnetization direction of the first or second antiferromagnetic material having the higher blocking temperature being set before a magnetization direction of the first or second antiferromagnetic material having the lower blocking temperature set [col 4, ln 22-41]. However, Gill appears to be silent in heating the magnetic layer structure with a current pulse that has a duration that prevent substantial heat transfer from the magnetic layer structure to an environment of the magnetic layer structure, so that a temperature of the environment is the same before and after the current. Fox remedies this.

Regarding claim 9, Fox teaches a method for forming a device with a magnetic layer structure by forming the magnetic layer structure [col 2, ln 62-67], and heating the magnetic layer structure with an electric current, the electric current comprising a current pulse having a duration such that no substantial heat transfer from the magnetic layer structure to an environment (insulating layers) of the magnetic layer structure takes place [col 3, ln 65-67; col 4, ln 1-10], which would allow for the temperature of the environment before and after the current pulse to be substantially the same since no heat was applied to the environment.

Alternatively, a position could be made that a large distance away from the heated magnetic layer that receives no substantial heat (i.e. outside a process chamber) would also read as an environment of the magnetic layer structure takes place that would allow for the temperature to be same before and after the current pulse. It is noted that specifying what would be considered the environment would overcome this broad interpretation.

It would have been obvious to one of ordinary skill in the art to apply a current that would avoid heat transfer to an environment of the magnetic layer structure as suggested by Fox. One would have been motivated to do so since Gill teaches it would be desirable to apply a current pulse discreetly enough so as to avoid undulying heating the first and second biasing layer which would cause degradation of such layers and Fox teaches a method of locally applying a current pulse so as to avoid heating adjacent layers [col 4, ln 4-6].

Regarding claim 10, the prior art teaches the duration of the current pulse is shorter than 100 ms [Fox, col 11, ln 25].

Regarding claim 11, the prior art teaches the device included in a magnetic system having a plurality of magnetoresistive devices [Fig. 17; col 5, ln 40-41].

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gill in view of Fox and further in view of Lenssen [US 6501678].

Teaching of Gill in view of Fox is aforementioned, but appears to be silent in teaching the magnetic system is arranged in a Wheatstone bridge configuration. Lenssen remedies this.

Regarding claim 12, Lenssen teaches a method for manufacturing or repairing magnetic data system [title], wherein Lenssen teaches it is often required in a number of applications to distinguish sensor system and sensing system due to temperature variations. One approach would be to configure the giant magnetoresistive sensor (GMR) in a Wheatstone configuration [col 2, ln 10-28].

It would have been obvious to one of ordinary skill in the art to configure the magnetic system into a Wheatstone bridge arrangement. One would have been motivated to do so in order to reduce unwanted response to environmental factors that may be picked by the sensing system [Lenssen, col 2, ln 19-23].

3. Claim 13 is rejected under 35 U.S.C. 102(b) as anticipated by Lenssen or, in the alternative, under 35 U.S.C. 103(a) as obvious over Lenssen in view of Fox.

Regarding claim 13, Lenssen teaches a method of manufacturing a magnetic data storage system (magnetoresistive bridge device) [abstract; Fig. 6] comprising a plurality of magnetoresistive bridge devices [Fig. 1a-b; 6; col 5, ln 46-60] by forming a magnetic layer structure [col 5, ln 50-60]; and may locally heating the magnetic layer structure with an current pulse (electric current) [col 6, ln 10-12], wherein a structure of the system has a magneto resistance effect by heating with a current pulse on or through the device under a magnetic field so as to irreversibly change a resistance of at least one of the magnetoresistive bridge device [col 11, ln 20-33]. In regards to no substantial heat transfer from the magnetic layer structure to an environment, a position could be made that a large distance away from the heated magnetic layer that receives no substantial heat (i.e. outside a process chamber) would also read as an environment of the magnetic layer structure takes place that would allow for the temperature to be same before and after the current pulse. It is noted that specifying what would be considered the environment would overcome this broad interpretation.

Alternatively in the case where Lenssen appears to be silent in teaching the electric current comprising a current pulse having a duration that prevents substantial

heat transfer from the magnetic layer structure to an environment of the magnetic layer structure so that a temperature of the environment before and after the current pulse is substantially the same; Fox remedies this.

Regarding claim 13, Fox teaches a method for forming a device with a magnetic layer structure by forming the magnetic layer structure [col 2, ln 62-67], and heating the magnetic layer structure with an electric current, the electric current comprising a current pulse having a duration such that no substantial heat transfer from the magnetic layer structure to an environment (insulating layers) of the magnetic layer structure takes place [col 3, ln 65-67; col 4, ln 1-10], which would allow for the temperature of the environment before and after the current pulse to be substantially the same since no heat was applied to the environment.

It would have been obvious to one of ordinary skill in the art to supply a current pulse having a duration that prevents substantial heat transfer from the magnetic layer structure to an environment of the magnetic layer structure so that a temperature of the environment before and after the current pulse is substantially the same, since Lenssen teaches it would be desirable to reorient locally one element without reorienting a neighboring element [col 12, ln 30-37], and Fox teaches changing a magnetic property without affecting another structure of the device [col 4, ln 1-10]. Although Lenssen does not explicitly teach the devices having insulating stacks, Fox teaches it is typical of GMR sensors to include insulating stacks to complete the device; wherein heating the entire device may lead to unwanted expansion of layers [col 3 ln 25-46].

Response to Arguments

4. Applicant's arguments, see pg 10, filed 02/05/10, with respect to the rejection(s) of claim(s) 1-13 (particularly claim 9) under 35 USC 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of references cited above.

In regards to the applicant' arguments, particular to Pelecky on page 8 of remarks, which argues Pelecky is direct to using the magnetic filed to change the physical mechanisms associated with the energy barrier, it is noted by the Examiner that Pelecky is provided as evidence that in order to modify a magnetic characteristics, a certain amount of activation energy is required; Pelecky is not relied upon for the source of the characteristic changes. Hence, argument is not persuasive.

Conclusion

1. No claim is allowed.
2. Claims 1-13 are rejected for the reasons aforementioned.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MANDY C. LOUIE whose telephone number is (571)270-5353. The examiner can normally be reached on Monday to Friday, 7:30AM - 5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571)272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. C. L./
Examiner, Art Unit 1792

/Timothy H Meeks/
Supervisory Patent Examiner, Art Unit 1792